

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference  PCT25654	<b>FOR FURTHER ACTION</b>  see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No.  PCT/IT2004/000380	International filing date (day/month/year)  09/07/2004	(Earliest) Priority Date (day/month/year)  13/08/2003
Applicant  CONSIGLIO NAZIONALE DELLE RICERCHE		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application; see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regards to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 2, 5

☐ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☒ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/IT2004/000380

## Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

The invention concerns a method for the reconstruction of holographic images in digital holography, the holographic images being detected and transformed in a digitized hologram by an image detection device, the digitized hologram being made of an array having a number  $V_r$  of elementary pixels, the sizes of which being equal to the sampling intervals of the image detection device, the method comprising a first step of processing the digitized hologram array (e.g. zero-order elimination, aberration correction), and a second step of digitally reconstructing the complex object in an observation plane starting from the digitized hologram processed in the first step, the method being characterised in that the second step is carried out through discrete Fresnel Transform applied on an array of  $V_e$  pixels having sizes equal to that of said elementary pixels, wherein said array of  $V_e$  pixels (50,51) includes said  $V_r$  pixels (51) and an integer number  $p=V_e-V_r>0$  constant values (50). The invention further concerns the instruments necessary to the execution of the method and the apparatus executing it.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IT2004/000380

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G03H1/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 G03H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KREIS T M ET AL: "METHODS OF DIGITAL HOLOGRAPHY: A COMPARISON" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 3098, 1997, pages 224-233, XP000964987 ISSN: 0277-786X the whole document	1-3,5,7, 8,12-14
Y	BERNHARDT M ET AL: "CODING AND BINARIZATION IN DIGITAL FRESNEL HOLOGRAPHY" OPTICS COMMUNICATIONS, NORTH-HOLLAND PUBLISHING CO. AMSTERDAM, NL, vol. 77, no. 1, 1 June 1990 (1990-06-01), pages 4-8, XP000127687 ISSN: 0030-4018 paragraphs '0001! - '0003! ----- -/--	1-3,5,7, 8,12-14

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

6 December 2004

Date of mailing of the international search report

22/12/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Noirard, P

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IT2004/000380

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SCHNARS U ET AL: "DIGITAL RECORDING AND NUMERICAL RECONSTRUCTION OF HOLOGRAMS" MEASUREMENT SCIENCE AND TECHNOLOGY, IOP PUBLISHING, BRISTOL, GB, vol. 13, no. 9, September 2002 (2002-09), pages R85-R101, XP001170845 ISSN: 0957-0233 paragraph '0003! -----	1,12-14
A	YAMAGUCHI I ET AL: "Phase-shifting color digital holography" OPTICS LETTERS OPT. SOC. AMERICA USA, vol. 27, no. 13, 1 July 2002 (2002-07-01), pages 1108-1110, XP002308739 ISSN: 0146-9592 cited in the application the whole document -----	1,12-14
A	US 6 411 406 B1 (KREUZER H JUERGEN) 25 June 2002 (2002-06-25) column 7, line 57 - column 8, line 50 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT2004/000380

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6411406	B1	25-06-2002 CA	2376395 A1
12-09-2002			